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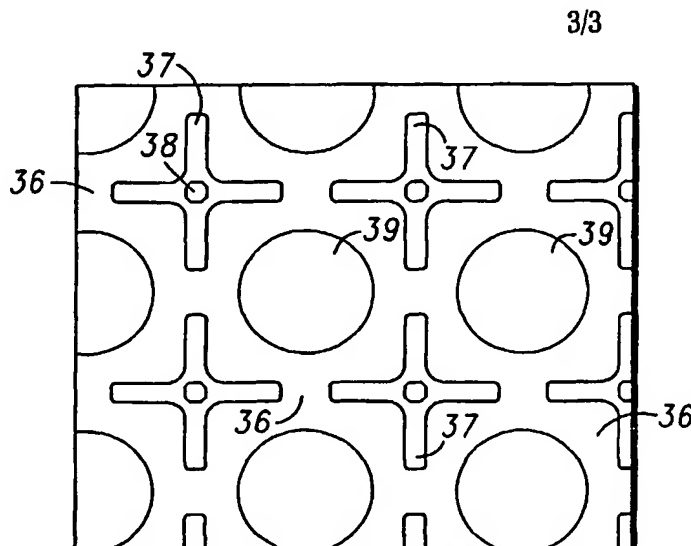
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ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: POWER SEMICONDUCTOR DEVICE AND METHOD OF MANUFACTURING THE SAME



(57) Abstract: A low on-state resistance power semiconductor device has a shape and an arrangement that increase the channel density and the breakdown voltage. The power semiconductor device comprises a plurality of individual cells formed on a semiconductor substrate (62). Each individual cell comprises a plurality of radially extending branches (80) having source regions (37) within base regions (36). The plurality of individual cells are arranged such that at least one branch of each cell extends towards at least one branch of an adjacent cell and wherein the base region (36) of the extending branches merge together to form a single and substantially uniformly doped base region (36) surrounding drain islands (39) at the surface of the semiconductor substrate (62).

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 013, no. 571 (E-862), 18 December 1989 (1989-12-18) -& JP 01 238173 A (SANYO ELECTRIC CO LTD), 22 September 1989 (1989-09-22) cited in the application abstract; figures 5,2,3	1-14
X	US 5 399 892 A (NEILSON J M S ET AL) 21 March 1995 (1995-03-21) cited in the application	1-9
A	column 3, line 16 - line 34; figures 4-6 column 3, line 49 -column 4, line 19; figure 10 --- -/-	10-12,14

☒ Further documents are listed in the continuation of box C.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 4 823 176 A (BALIGA B J ET AL) 18 April 1989 (1989-04-18) cited in the application column 12, line 32 - column 14, line 25; figures 12-15 column 16, line 26 - line 28</p>	1-14

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 01238173	A	22-09-1989	JP 1958492 C	10-08-1995
			JP 6087506 B	02-11-1994
US 5399892	A	21-03-1995	DE 69418057 D1	27-05-1999
			DE 69418057 T2	18-11-1999
			EP 0731985 A1	18-09-1996
			JP 9505691 T	03-06-1997
			WO 9515008 A1	01-06-1995
			US 5468668 A	21-11-1995
US 4823176	A	18-04-1989	NONE	

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